

November 4, 2005  
Project No. 05-166

Mr. Evan McMullen  
14642 NE 13<sup>th</sup> Street  
Bellevue, WA

**Subject: Geotechnical Engineering Evaluation  
McMullen Short Plat  
1405 148<sup>th</sup> Ave NE, Bellevue, Washington**

Dear Mr. McMullen,

This letter presents our geotechnical evaluation of the proposed short platting of your property located at 1405 148<sup>th</sup> Ave NE in Bellevue. We understand that the short plat will create 8 residential lots on the property along with an access road. This letter addresses the geotechnical suitability of the property for short platting and presents general recommendations that should be followed in the overall development of the lots. Our recommendations are based on a review of existing geologic data for the area and a reconnaissance of the site conducted on October 29, 2005. Additional studies, that may include site explorations, will be needed to finalize the recommendations in this letter as respect to the proposed location of individual residential dwellings and details for street and utility installations.

### **SITE DESCRIPTION**

Your property is located in Bellevue about 1,200 feet south of the intersection of 148<sup>th</sup> Avenue NE and NE Bellevue Redmond Road (see Figure 1). Currently the property is undeveloped and is vegetated with low lying brush and mature fir trees. As indicated in Figure 2, your property is rectangular in shape with approximately 280 feet of frontage along 148<sup>th</sup> Avenue NE and a depth of about 580 feet, which results in approximately 3.7 acres. Figure 2 also shows that the ground surface topography at the site slopes gently to the southwest, providing about 55 feet of topographic relief across the site. The highest point at the site, at an approximate elevation of 300 feet, is located at the northeast corner of the site and the lowest point, at an approximate elevation of about 245 feet, is located at the southwest boundary. While the ground surface of the property has an average slope of about 10(H):1(V), local areas with heights limited to about 10 feet

may have slopes as steep as 2(H):1(V). Finally, the headwaters of Kelsey Creek are located along the southern boundary of the property.

The proposed short plat will include creating 8 lots on the property, as illustrated in Figure 3, with 6 lots along northern half of the property and 2 lots at the south east corner of the property. The south western portion of the property, adjacent to Kelsey Creek, will not be developed and will remain as a wetland buffer. Access to the properties will be from a road off 148<sup>th</sup> Avenue NE.

Development of the lots and property will likely require minor hillside cuts and fills with typical heights of about 6 feet. While Figure 3 presents conceptual plans for the development, actual locations and footprints of the residential dwellings and associated landscaping may differ from those shown on Figure 3.

### **SUBSURFACE CONDITIONS**

The *Geologic Map of the King County, Washington* (Booth and others, 2002) indicates that the property is underlain by glacial till. Glacial till, also called “hardpan”, is a very compact, heterogeneous mixture of clay, silt, sand and gravel. When undisturbed, glacial till is readily capable of supporting building foundations. Our site observations tend to confirm this assessment with the possible exception that some of the near surface soils could be weathered till or ice contact deposits consisting of silt, sand and some gravel.

### **HILLSIDE STABILITY**

Hillside stability is not an issue for the proposed short plat because of the gentle slopes at the site and the fact that the property does not lie within a landslide sensitive area as defined by King County or the City of Bellevue. While the City of Bellevue Geologic Hazard Map identifies portions of the eastern boundary of the site as having slopes locally steeper than 40% (2.5(H):1(V)) the actual slopes along the eastern boundary do not appear to be that steep and the slope heights are generally about 6 feet or less. Consequently, that the gentle slopes of the property, limited sections of somewhat steeper slopes and underlying conditions of glacial till do not represent a slope stability hazard.

### **LIQUEFACTION POTENTIAL**

The property within the short plat is not susceptible to liquefaction because the underlying soils are deposits of dense glacial till. Similarly, the City of Bellevue Geologic Hazard Map does identify any potential areas of liquefaction underlying the site. This conclusion would be confirmed with site borings when a building layout is developed for the lots.

### **INFILTRATION**

Infiltration tests were not conducted at the property in our current scope of work. However, we believe that the site soils are relatively impermeable and would have infiltration rates of less than 1 inch per hour. Subsurface borings will be needed for the final design of the development to provide specific data on the subsurface conditions and potential infiltration rates.

### **SETBACKS AND BUFFERS**

Because of the gentle slopes at the site we have no specific building setback recommendations for the site development. However, we do recommend a minimum building set back of 5 feet from rockeries protecting cut or fill slopes where the rockery height is 6 feet or less. Higher rockeries would require greater set back distances. For final design, we will need to review site grading and building plans for conformance with the above.

### **CUTS AND FILLS**

We recommend that all permanent cuts and fills have slopes no steeper than 2(H):1(V). The underlying glacial till may support temporary excavation cuts with slopes as steep as ½(H):1(V).

### **RETAINING WALLS**

Rockeries and retaining walls may be used to retain hillside cut and fill slopes. Unless specifically reviewed, rockeries should be limited to a height of 6 feet for both cut and fill slopes. Mechanically stabilized earth (MSE) retaining walls may be used to retain fill slopes with heights up to about 12 feet.

## **FOUNDATION DESIGN RECOMMENDATIONS**

### **SEISMIC CONSIDERATIONS**

The seismic design of the residential dwellings will be accomplished using the 2003 International Building Code (IBC), which specifies a design earthquake having a 2% probability of occurrence in 50 years (return interval of 2,475 years). The following parameters, which are consistent with the 2002 USGS seismic hazard maps, are recommended for the seismic design:

Site Class	Spectral Acceleration at 0.2 sec. (g)	Spectral Acceleration at 1.0 sec. (g)	Site Coefficients		Design Spectral Response Parameters		Control Periods (sec.)		Design PGA ( $S_{DS}/2.5$ )
	$S_s$	$S_1$	$F_a$	$F_v$	$S_{DS}$	$S_{D1}$	$T_O$	$T_S$	
C	1.32	0.45	1.0	1.35	0.88	0.41	0.09	0.46	0.35

### FOOTING DESIGN PARAMETERS

It is our opinion that shallow footings are appropriate for construction on the lots. All footings should be founded on dense, undisturbed glacial till. All footings should be placed below the frost penetration depth for this region, which requires a minimum embedment of at least 18 inches. The depth to undisturbed till will vary somewhat over the site, but will generally be 1 foot or less. Strip footings should be a minimum of 16 inches wide, and square footing should be a minimum of 24 inches square.

Spread footings should be sized using a maximum allowable bearing pressure of 3,000 psf. The recommended allowable bearing pressure may be increased by 1/3 for transient loading conditions when using allowable stress design. All footing excavations should be trimmed neat and footing subgrades should be carefully prepared. Any loose or softened soil should be removed from the footing excavation, and the native subgrade should be compacted prior to footing construction. Footing excavations should be observed by PanGEO to confirm that the exposed footing subgrade is consistent with the expected conditions and adequate to support the proposed building.

Total and differential settlements under service loads are anticipated to be within tolerable limits for footings designed and constructed as discussed above. Under static loads, we anticipate the footings will settle less than 1 inch.

### BASEMENT WALLS

**Lateral Earth Pressures** – Basement walls may be designed for an equivalent fluid pressure of 35 pcf assuming level ground behind the walls and 50 pcf assuming a 2(H):1(V) slope behind the walls. For seismic loading, we recommend applying a uniform load of 6H (psf) for the seismic load where H is the height (expressed in feet) of retained soil behind the wall. The recommended lateral pressures assume that the backfill

behind the wall will consist of properly compacted structural fill and adequate wall drainage provisions are incorporated into the design and construction of the walls.

**Wall Drainage** – As a minimum, provisions for permanent control of subsurface water should consist of a perforated drainpipe behind and at the base of the wall footings, embedded in clean, free-draining sand and gravel. Free draining sand and gravel or a composite drainage material should be used to provide drainage at the face of the wall. The drainpipe should be graded to direct water away from the backfill and subgrade soils and to a suitable outlet.

**Lateral Resistance** – Lateral forces from wind or seismic loading and unbalanced lateral earth pressures may be resisted by a combination of passive earth pressures acting against the embedded portions of the foundations and by friction acting on the base of the foundations. Passive resistance values may be determined using an equivalent fluid weight of 350 pounds per cubic foot (pcf). This value includes a factor of safety of 2, assuming that the structural fill adjacent to the sides of the footing has been compacted. A friction coefficient of 0.4 may be used to determine the frictional resistance at the base of the footings. This coefficient includes a factor safety of approximate 1.5.

**Wall Backfill** – Free draining granular soils are recommended for use as backfill for the basement walls. On site soils with appropriate drainage measures may be used in this application, but we will need to review the suitability of the on-site soils for this use.

Imported wall backfill should have a maximum dimension less than 1¼ inch, and less than 5 percent passing the U.S. Standard No. 200 sieve. The fill may consist of naturally occurring aggregate or recycled crushed concrete.

Wall backfill should be moisture conditioned to within about 3 percent of optimum moisture content, placed in loose, horizontal lifts less than 8 inches in thickness, and systematically compacted to a dense and relatively unyielding condition and to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557. Within 5 feet of the wall, the backfill should be compacted to 90 percent of the maximum dry density.

#### **CONCRETE SLAB ON GRADE FLOORS**

Conventional slab-on-grade concrete floors are appropriate for the residential construction. Interior floors should be underlain by a capillary break consisting of at least of 4 inches of 1-1/2-inch minus, clean wash rock (less than 3 percent fines) compacted to a firm and unyielding condition. The capillary break should be placed on subgrade that has been compacted to a dense and unyielding condition. A 10-mil

polyethylene vapor barrier should also be placed directly below the slab. We also recommend that construction joints be incorporated into the floor slab to control cracking.

The capillary break material should be placed on dense, native till material that has been compacted to an unyielding condition. The slab may be supported on till fill, so long as it is free of organic material and can be properly moisture conditioned and compacted to 95 percent of the maximum dry density as determined by ASTM test method D 1557. Alternatively, the floor slab should be supported on imported fill that conforms to the specifications for wall backfill, described above.

### **ROADWAYS**

All roadways should have a minimum pavement section consisting of 3 inches of asphalt overlying 4 inches of Crushed Surfacing Base Course. All fill and the native subgrade underlying the roadway sections should be compacted to 95% of the materials maximum dry density. Final details for the roadway construction will be needed to confirm the above general recommendations.

### **ADDITIONAL SERVICES**

The recommendations contained in this letter are general in nature and will need to be reviewed for consistency with the final building layout and associated levels of cuts and fills. After the layout plans have been developed, explorations should be advanced at the site confirm subsurface conditions and the recommendations contained in this letter.

To confirm that our recommendations are properly incorporated into the design and construction of the proposed construction, PanGEO should be retained to conduct a review of the final project plans and specifications, and to monitor the construction of geotechnical elements. The City of Bellevue, as part of the permitting process, may also require geotechnical construction inspection services.

At a minimum, we anticipate that the following additional services may be required:

- Site exploration and finalization of the design recommendations contained in this report
- Review of final project plans and specifications
- Monitor erosion control
- Verify footing subgrade
- Confirm placement of drainage materials behind basement walls
- Confirm adequacy of compaction of fill soils behind basement walls and below floor slabs

- Confirm the adequacy of the construction of the roadway segments and utility (trench) installations
- Other consultation as may be required during construction

Should special inspection services be required by the City of Bellevue, PanGEO will prepare a scope of work proposal and estimated budget for these services. Modifications to our recommendations presented in this report may be necessary, based on the actual conditions encountered during construction.

### **CLOSURE**

We have prepared this report for your use and that of the project design team. Recommendations contained in this report are based on a site reconnaissance, a review of pertinent subsurface information, and our understanding of the project. The study was performed using a mutually agreed-upon scope of work.

Variations in soil conditions may exist at locations away from the explorations. The nature and extent of the soil variations may not be evident until construction occurs. If any soil conditions are encountered at the site that are different from those described in this report, we should be immediately notified to review the applicability of our recommendations. Additionally, we should also be notified to review the applicability of our recommendations if there are any changes in the project scope.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our work specifically excludes the assessment of site environmental characteristics, particularly those involving hazardous substances. We are not mold consultants nor are our recommendations to be interpreted as being preventative of mold development. A mold specialist should be consulted for all mold-related issues.

This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project

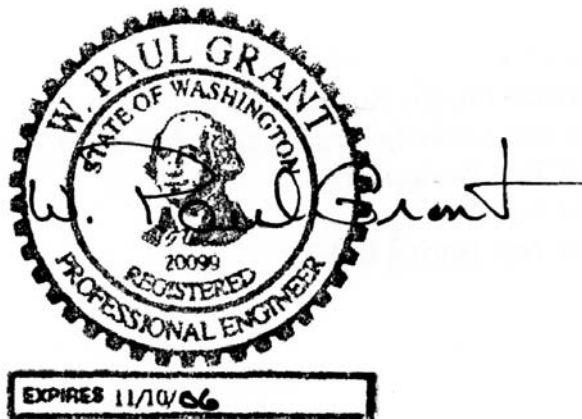
November 4, 2005  
McMullen Short Plat

is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

Please call if there are any questions on this report.

Sincerely,



W. Paul Grant, P.E.  
Principal Geotechnical Engineer

Enclosures:

Figure 1 Vicinity Map  
Figure 2 Site Plan  
Figure 3 Conceptual Layout

November 4, 2005  
McMullen Short Plat

## **REFERENCES**

Booth, D.B., Haugerud, R.A. and Sacket, J.B., 2002, Geologic map of King County  
International Building Code (IBC), 2003, International Code Council



Scale 1" ~ 400'

05-065\_Vicinity.ppt - 11/4/2005(10:12 AM) - SHE

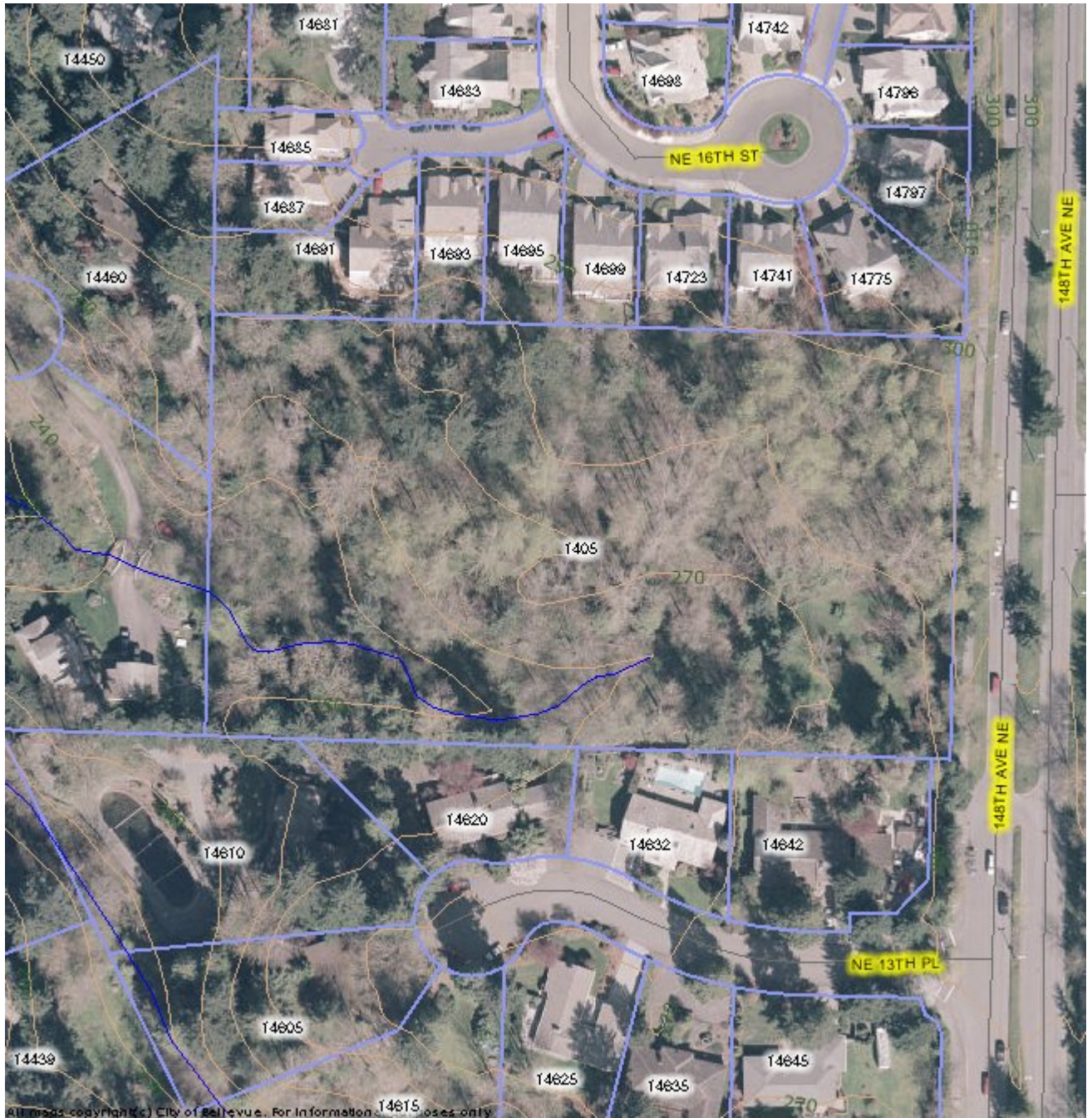


**McMullen Short Plat**  
**1405 148<sup>th</sup> Ave NE**  
**Bellevue, Washington**

**VICINITY MAP**

Project No. 05-166

Figure No. 1



05-065 Vicinity.ppt 11/4/2005(10:12 AM) SHE



**McMullen Short Plat**  
**1405 148<sup>th</sup> Ave NE**  
**Bellevue, Washington**

**SITE PLAN**

Project No. 05-166

Figure No. 2



**McMullen Short Plat**  
**1405 148th Ave NE**  
**Bellevue, Washington**

**CONCEPTUAL LAYOUT**

Project No.

05-166

Figure No.

3